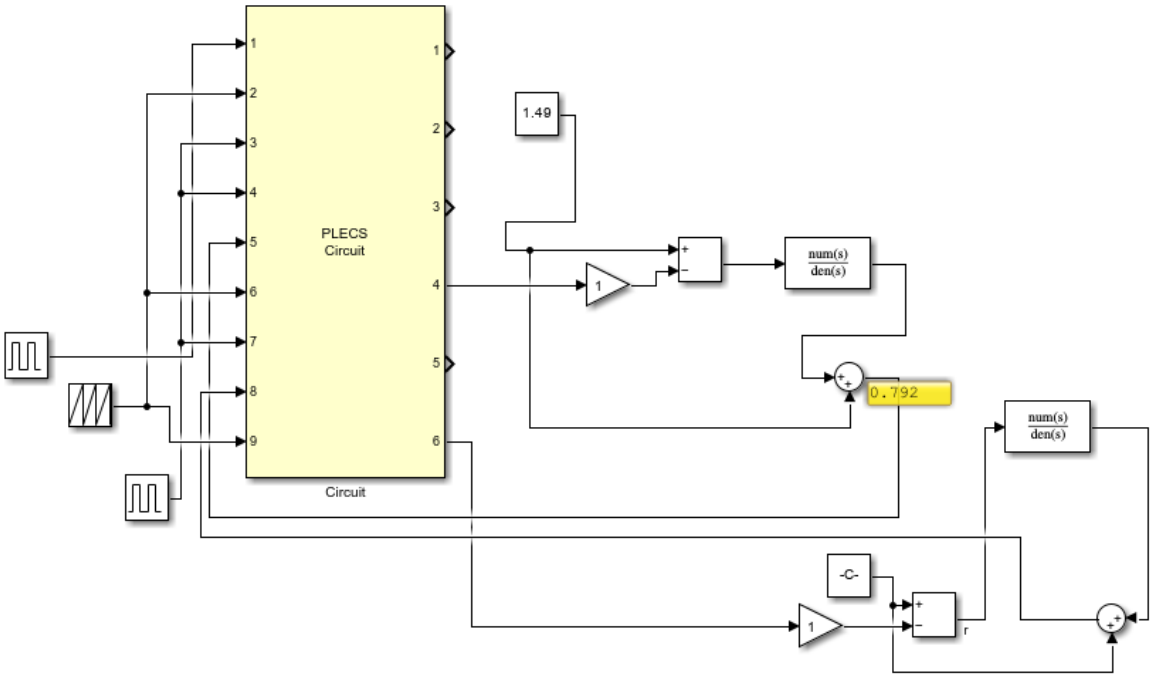
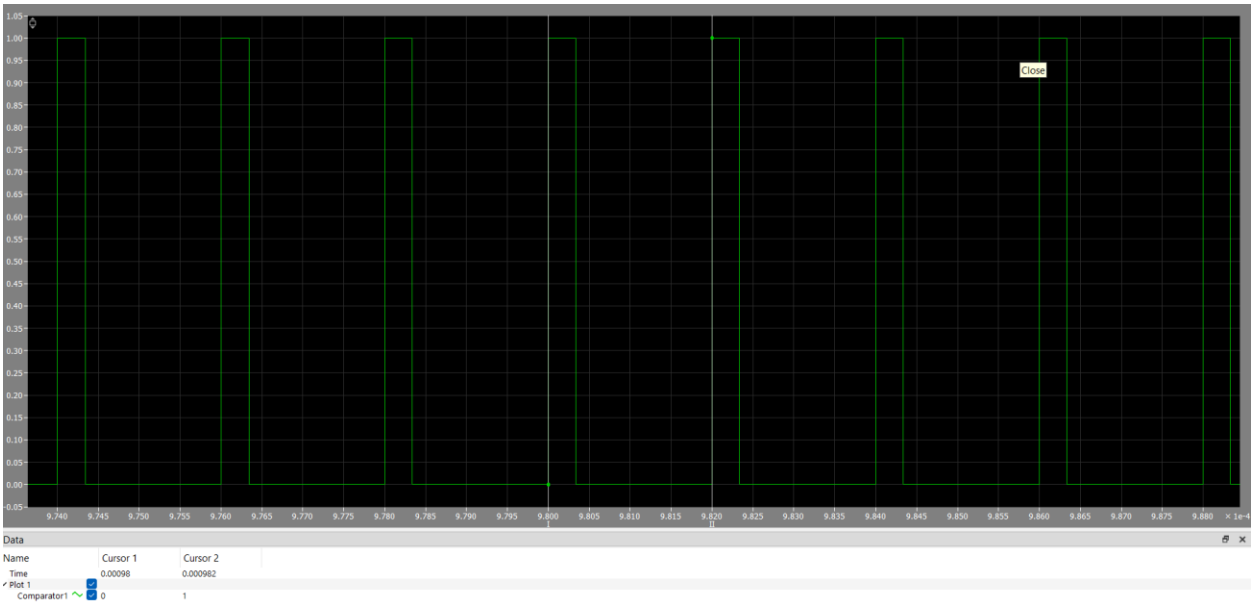
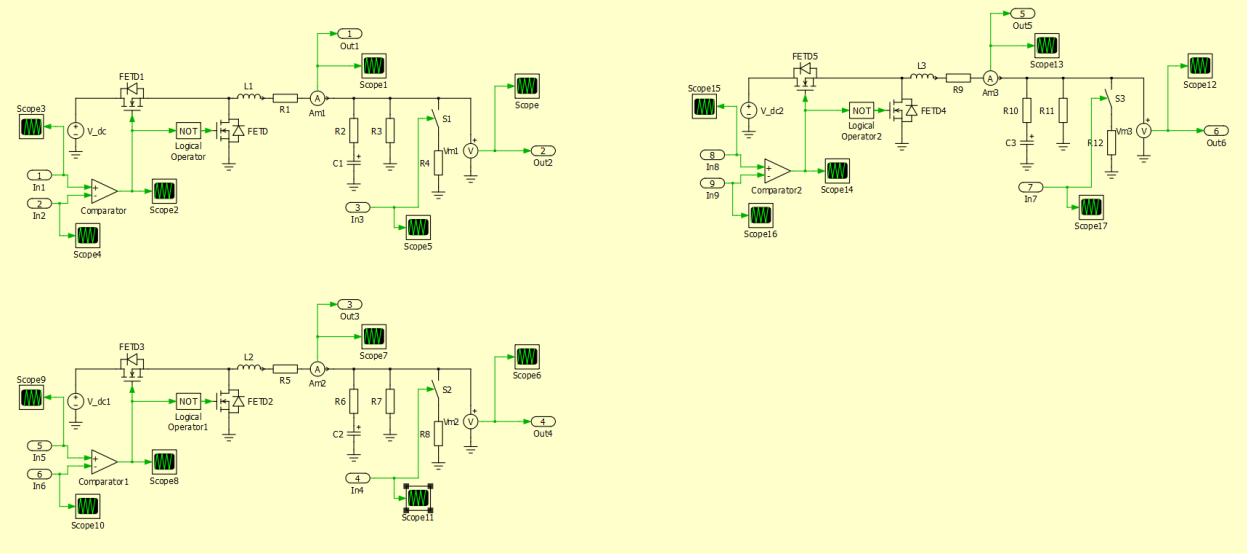
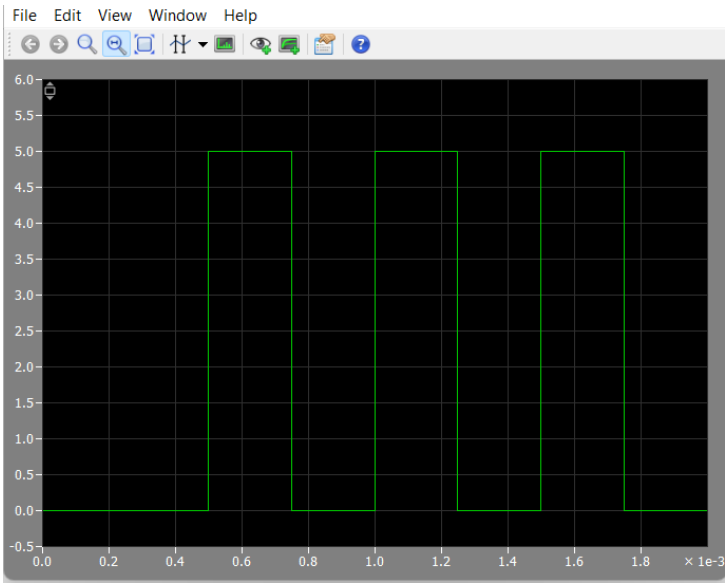


第一個模組為開路沒有補償器，Input 是 IN1, IN2,IN3 分別是開迴路 5V 方波，IN2 是三角波按照投影片上設計，IN3 為動態負載分別為 0.5A,1A，一個 cycle 是 0.5 秒，0.25 秒時會開負載使電流達到 1A 後再關負載變到 0.5A,故在開啟時會有波動由於第一個沒有補償器因此會發現當一有開關會震盪很久無法達到穩態。out1,out2 是開路的 Output port。IN456 AND OUT 3,4 是手算的 PORT, IN789 AND OUT 5,6 是 SISOTOOL 方法電路。

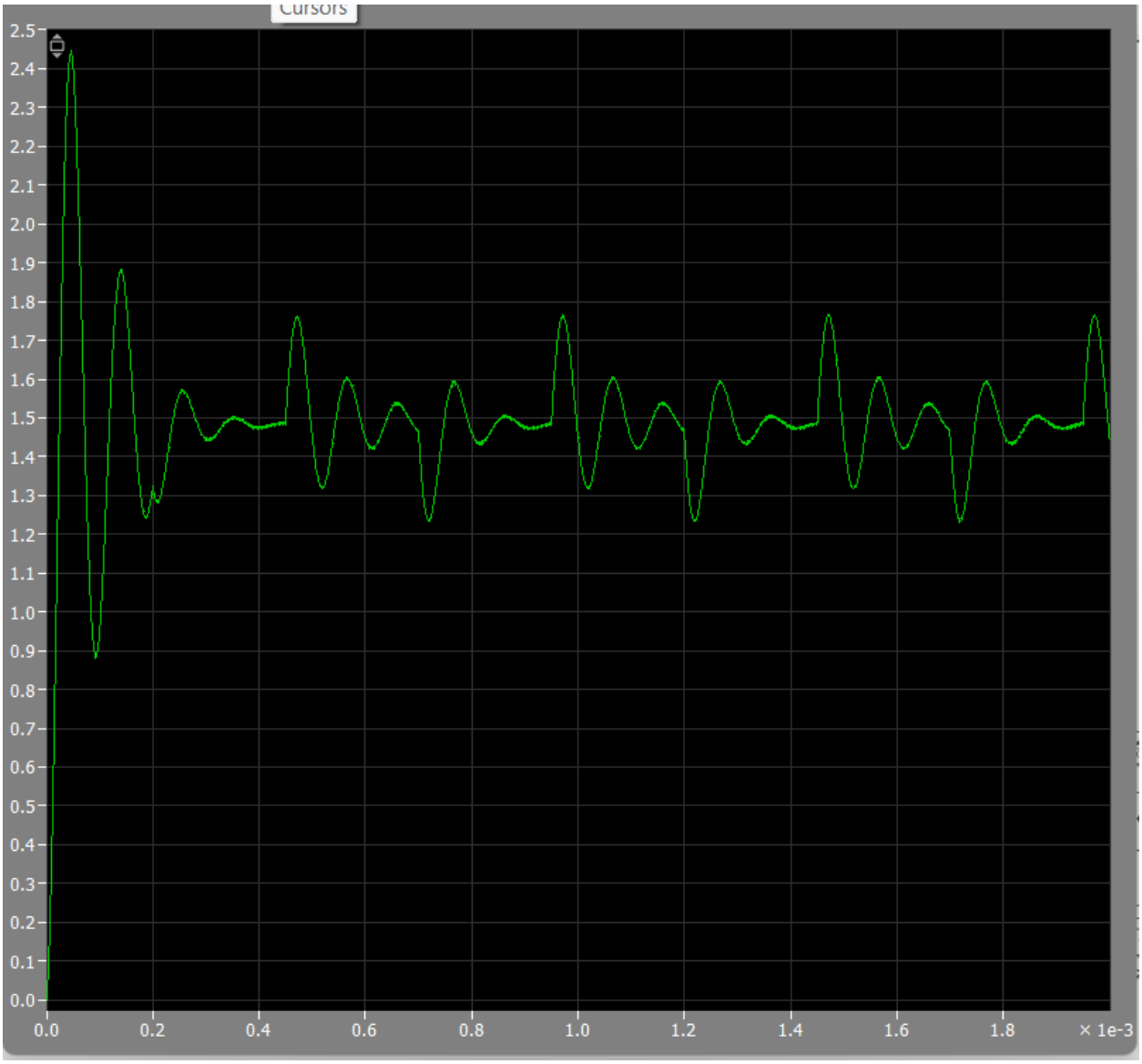


500kHz 切換頻率


Out1
Scope1
FETD1
L1
R1
Am1
Scope3
V_dc
NOT
Logical
Operator
FETD
R2
R3
S1
Scope
Out2
In1
In2
Comparator
Scope2
C1
R4
Vm1
In3
Scope5
Scope4
Out5
Scope13
FETD5
L3
R9
Am3
Scope15
V_dc2
NOT
Logical
Operator2
FETD4
Scope12
R10
R11
S3
Vm3
Out6
In8
In9
Comparator2
Scope14
C3
R12
In7
Scope17
Scope16
Out3
Scope7
FETD3
L2
R5
Am2
Scope9
V_dc1
NOT
Logical
Operator1
FETD2
Scope6
R6
R7
S2
Vm2
Out4
In5
In6
Comparator1
Scope8
C2
R8
In4
Scope11
Scope10


File Edit View Window Help
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
0.0 0.2 0.4 0.6 0.8 1.0 1.2 1.4 1.6 1.8 × 1e-3

動態負載開關



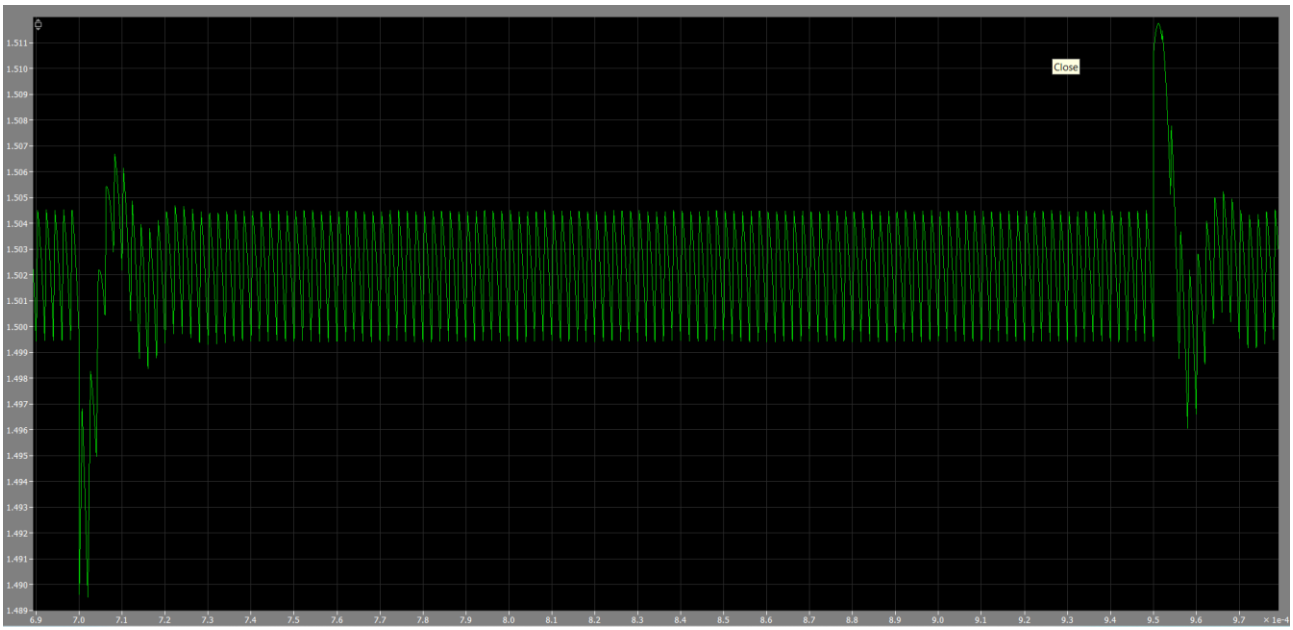
沒有補償器穩態電壓

利用老師上課的方法，計算出 PID 的轉移函數，先算出調變氣的增益 Hsense*(1/VM)*Gvd，再找出 crossover target,找積分(5.9 kHz)微分(79.3 kHz)零點，找微分濾波極點(0.238MHz), Kp=43.56 產生 CROSSWORK PID，phase margin105 度

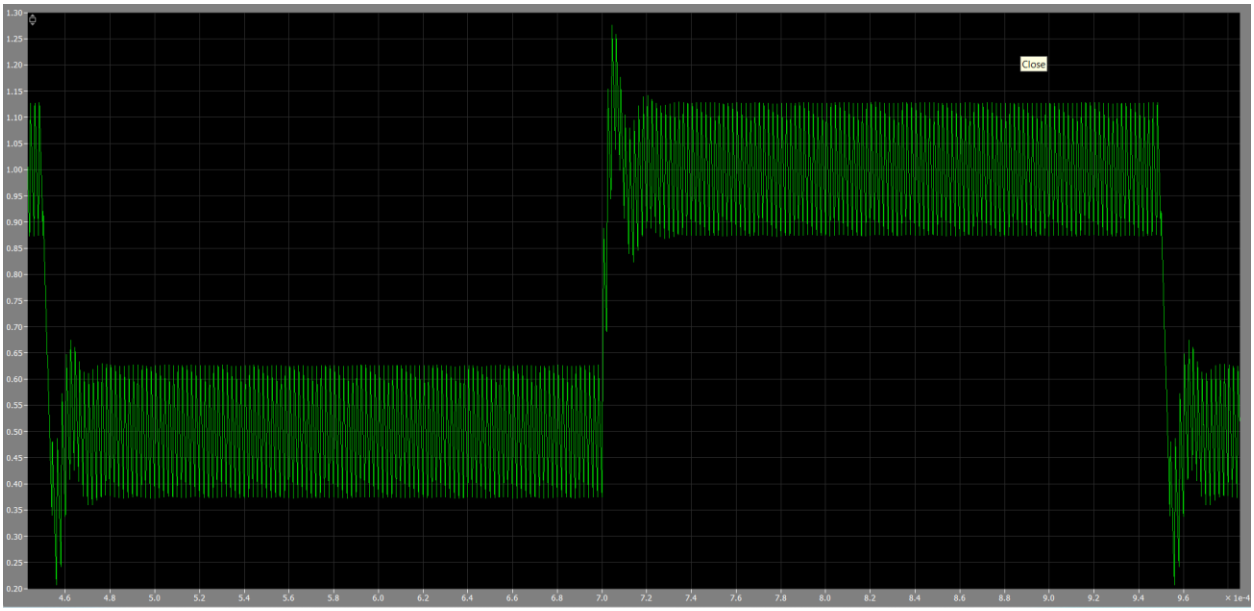
```
numd =
   67.8937    9.4641  -19.2309

dend =
    1.0000   -0.0003   -0.9997
```

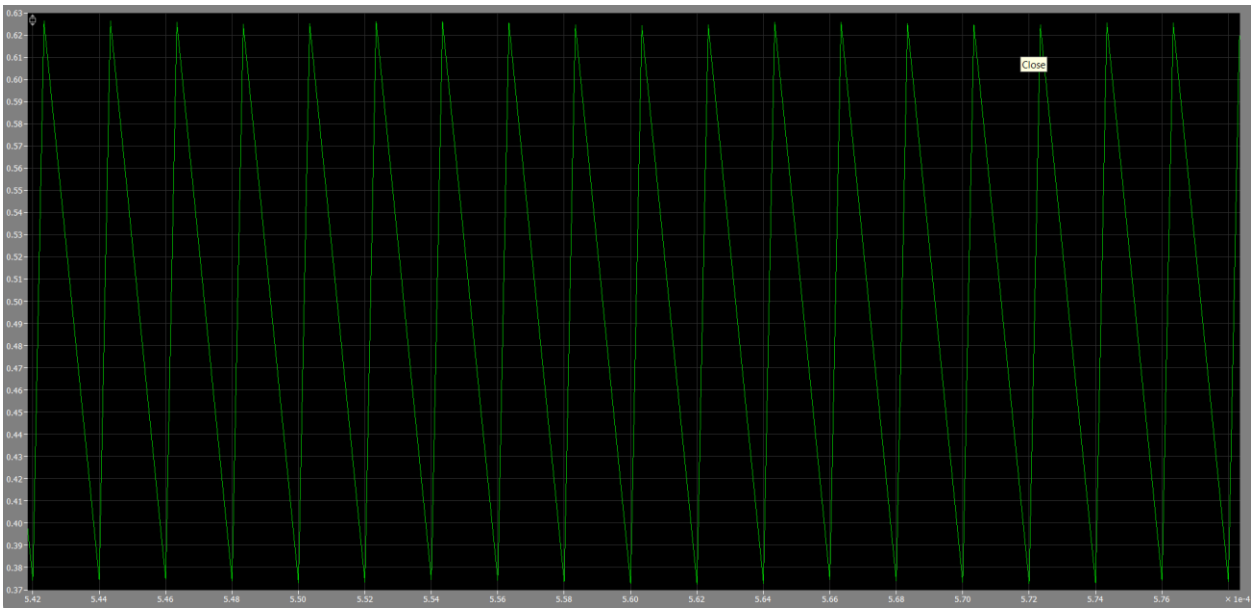
Num and dend 的參數



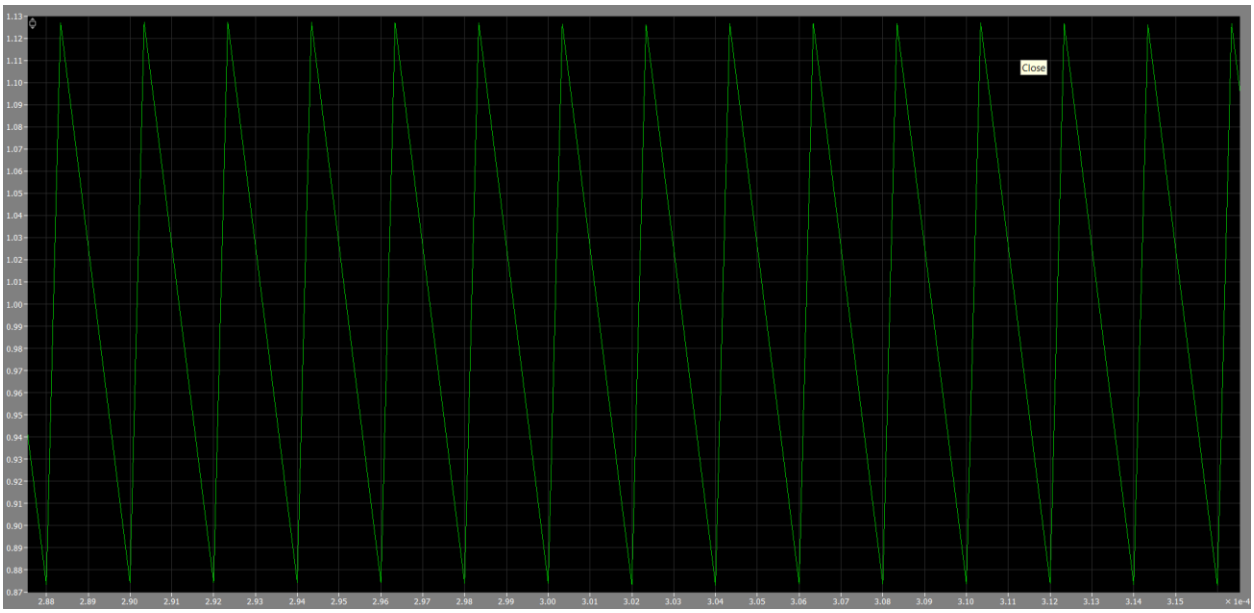
手算 PID 穩態電壓



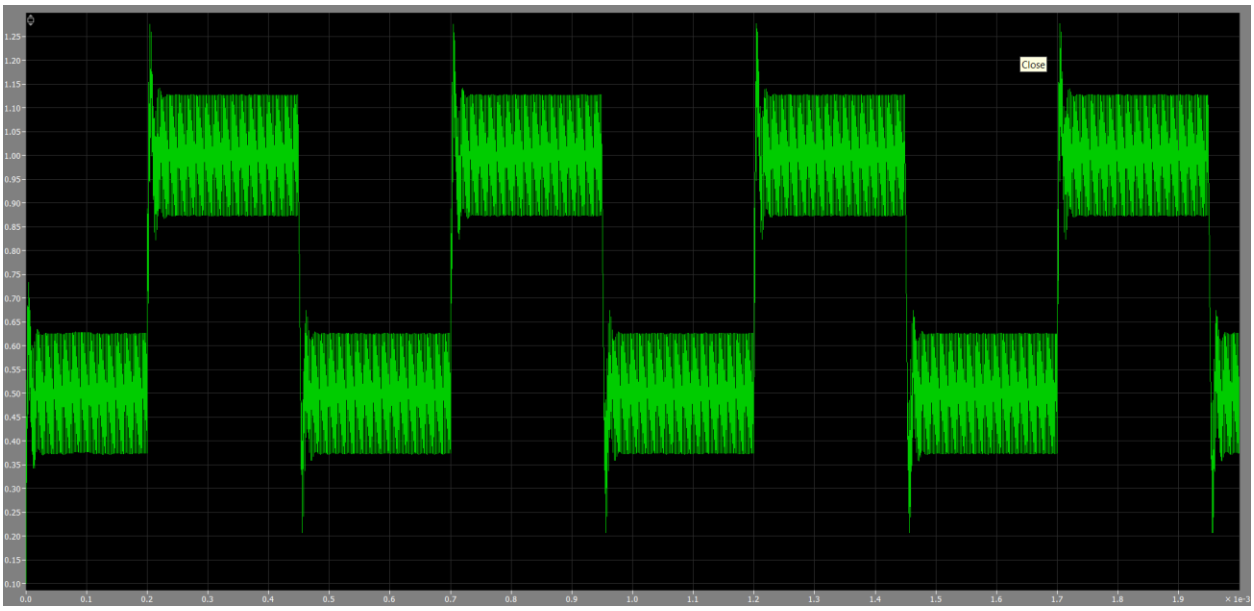
手算 PID 穩態電流



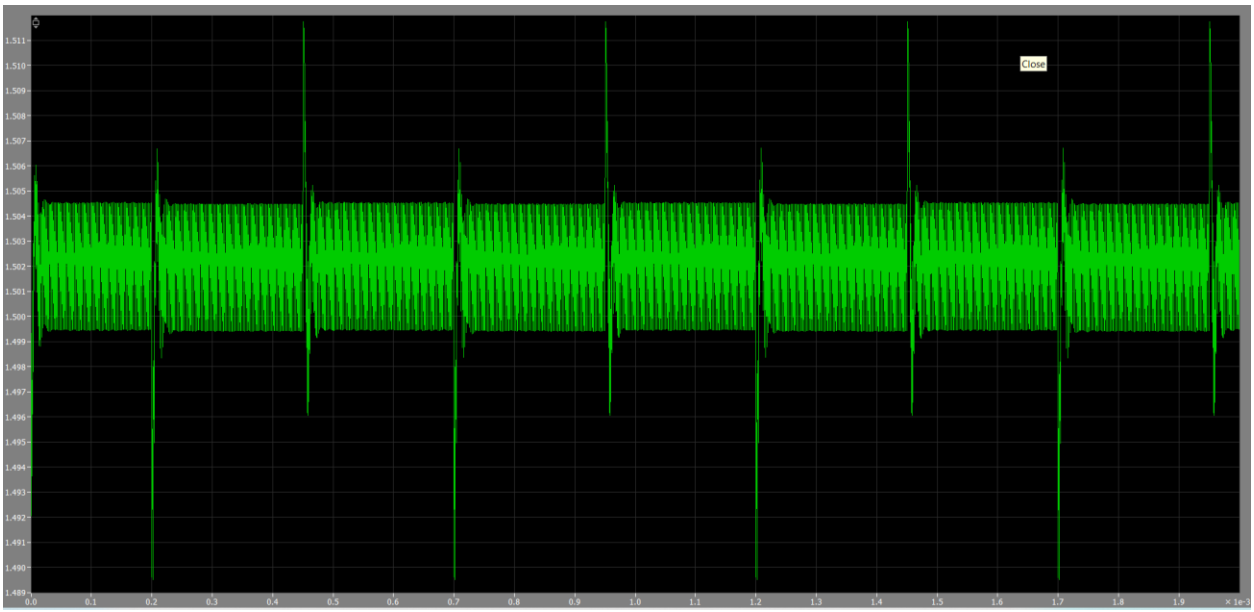
0.5A 穩態電流



1A 電流

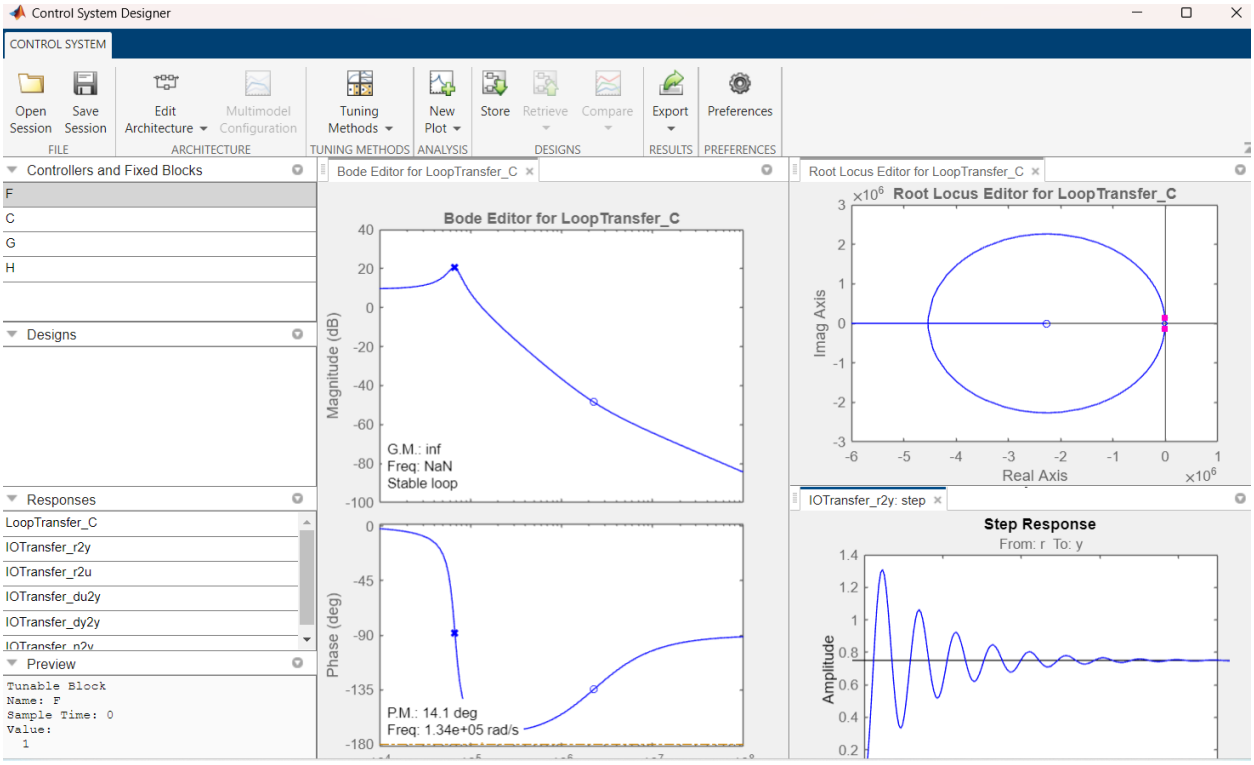


手算 PID 穩態電流

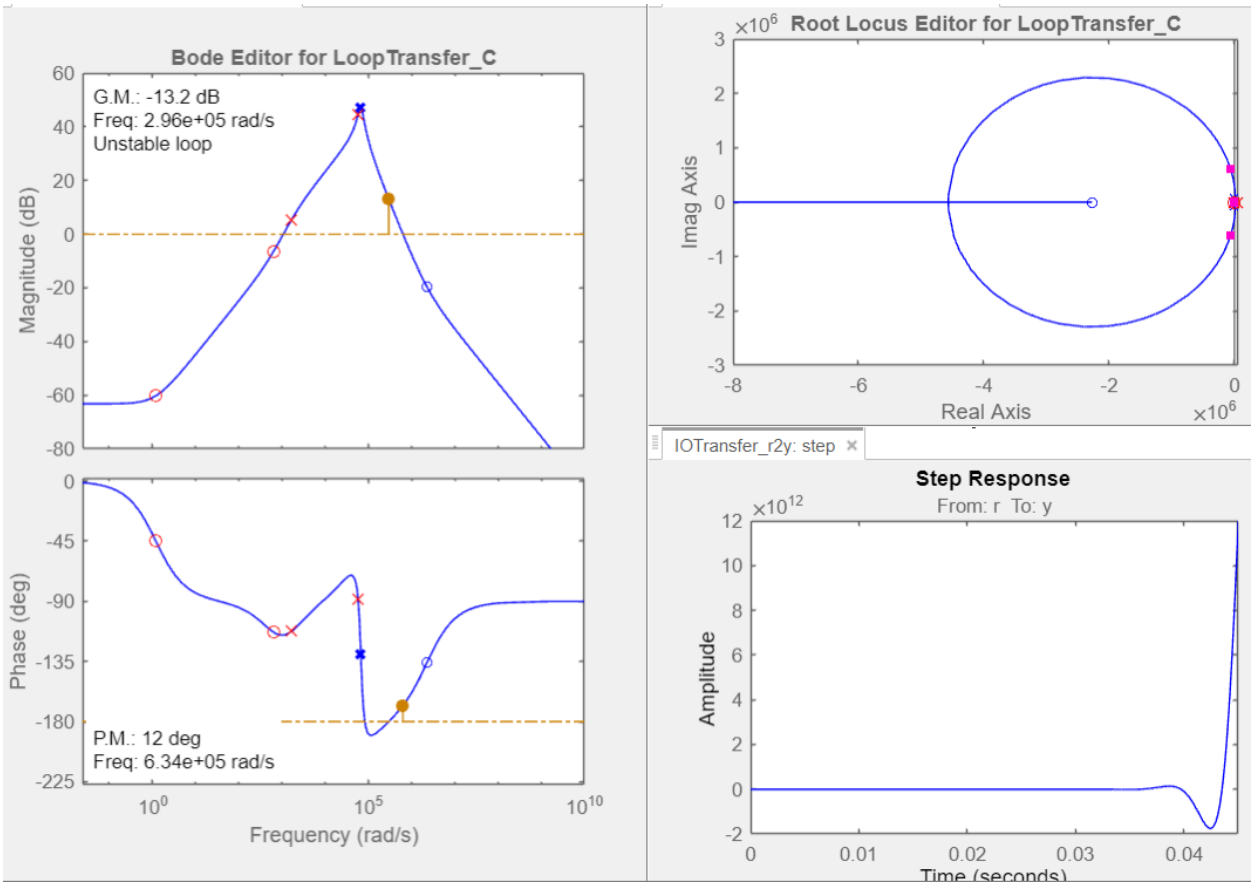


手算 PID 暫態電壓

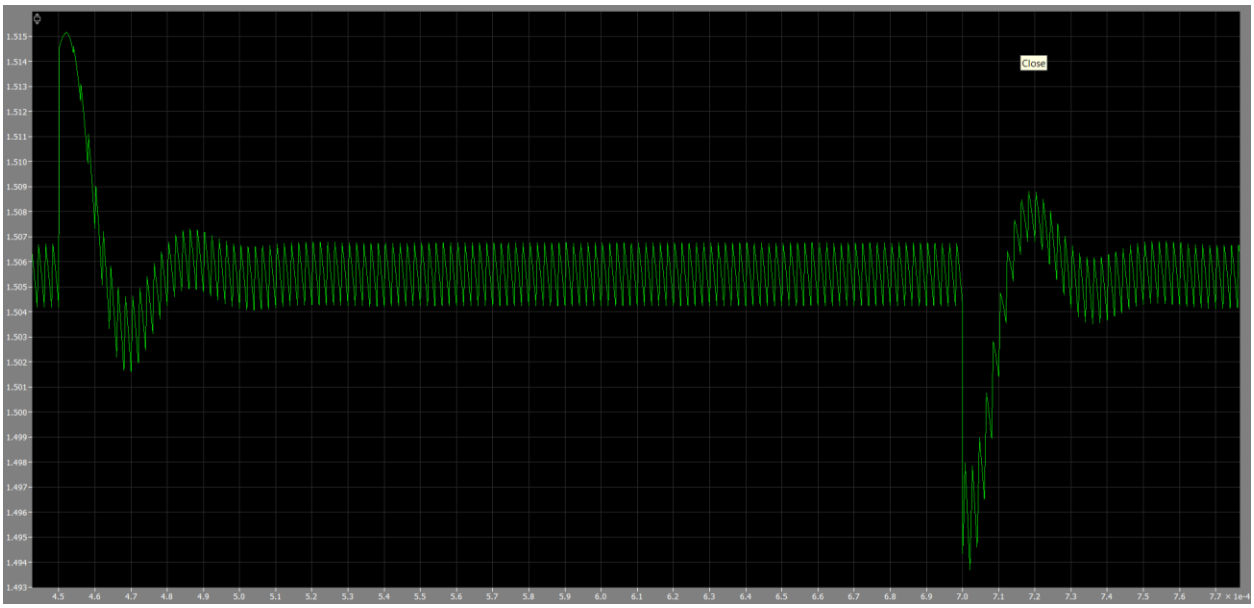
Sisotool 5


Control System Designer
CONTROL SYSTEM
Open Session
Save Session
Edit Architecture
Multimodel Configuration
Tuning Methods
New Plot
Store
Retrieve
Compare
Export
Preferences
FILE
ARCHITECTURE
TUNING METHODS
ANALYSIS
DESIGNS
RESULTS
PREFERENCES
Controllers and Fixed Blocks
F
C
G
H
Designs
Responses
LoopTransfer_C
IOTransfer_r2y
IOTransfer_r2u
IOTransfer_du2y
IOTransfer_dy2y
Preview
Tunable Block
Name: F
Sample Time: 0
Value:
1
Bode Editor for LoopTransfer_C
Bode Editor for LoopTransfer_C
Magnitude (dB)
Phase (deg)
G.M.: inf
Freq: NaN
Stable loop
P.M.: 14.1 deg
Freq: 1.34e+05 rad/s
Root Locus Editor for LoopTransfer_C
Root Locus Editor for LoopTransfer_C
Imag Axis
Real Axis
IOTransfer_r2y: step
Step Response
From: r To: y
Amplitude

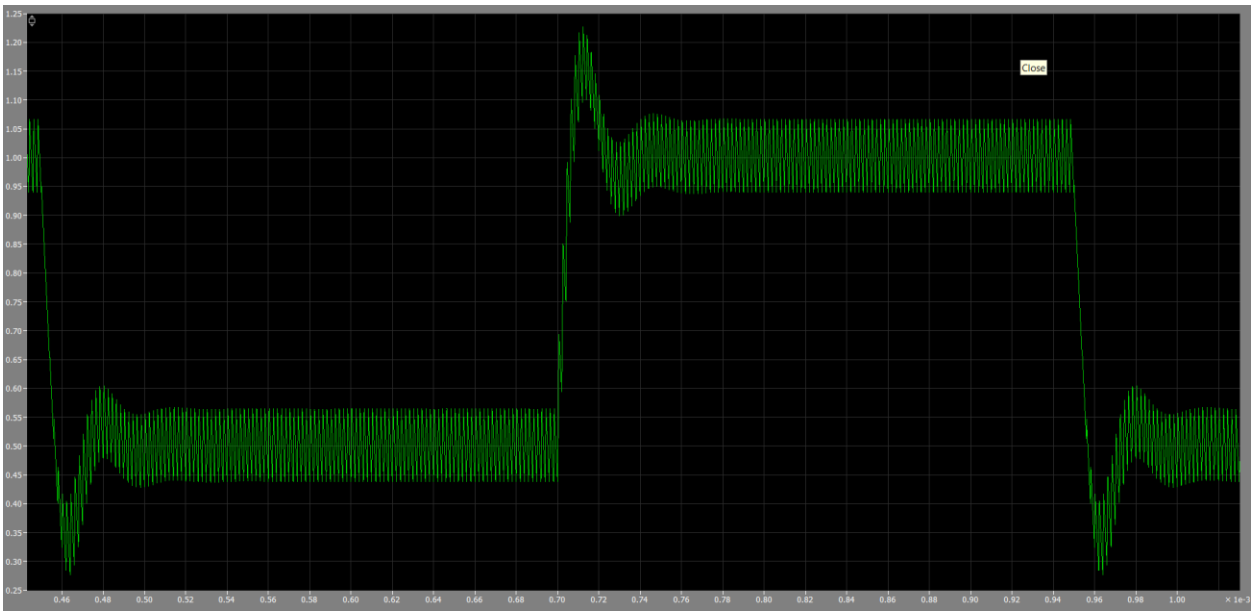
原始的 sisotool 系統



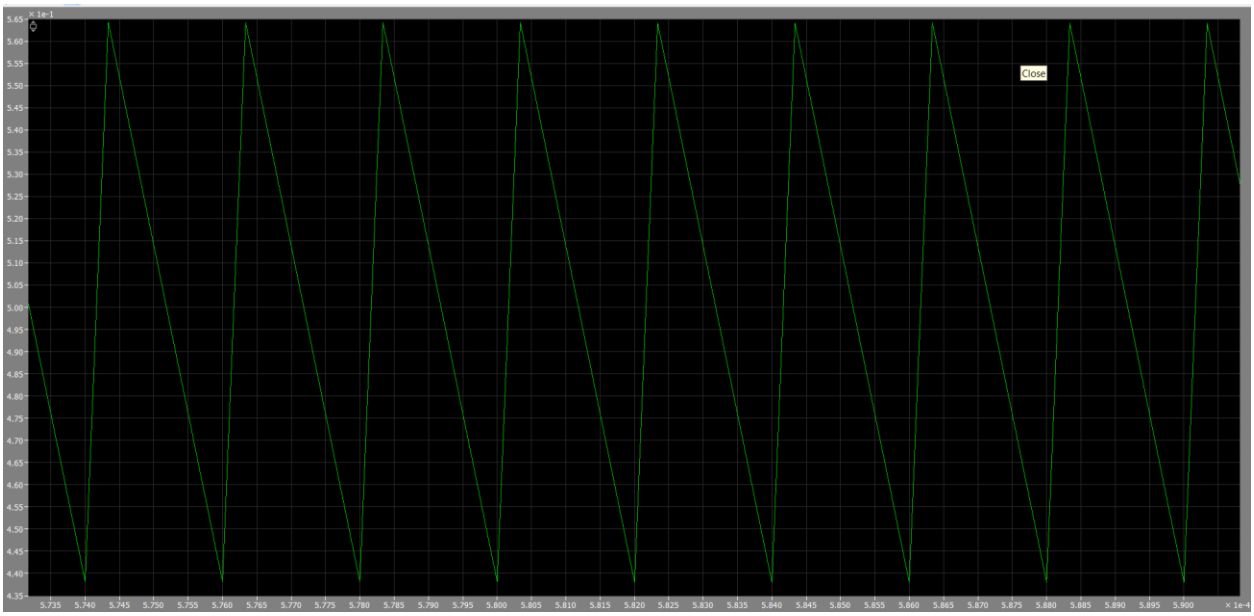
利用手算去精用 sisotool 的 bode plot 可以看到輸出結果為



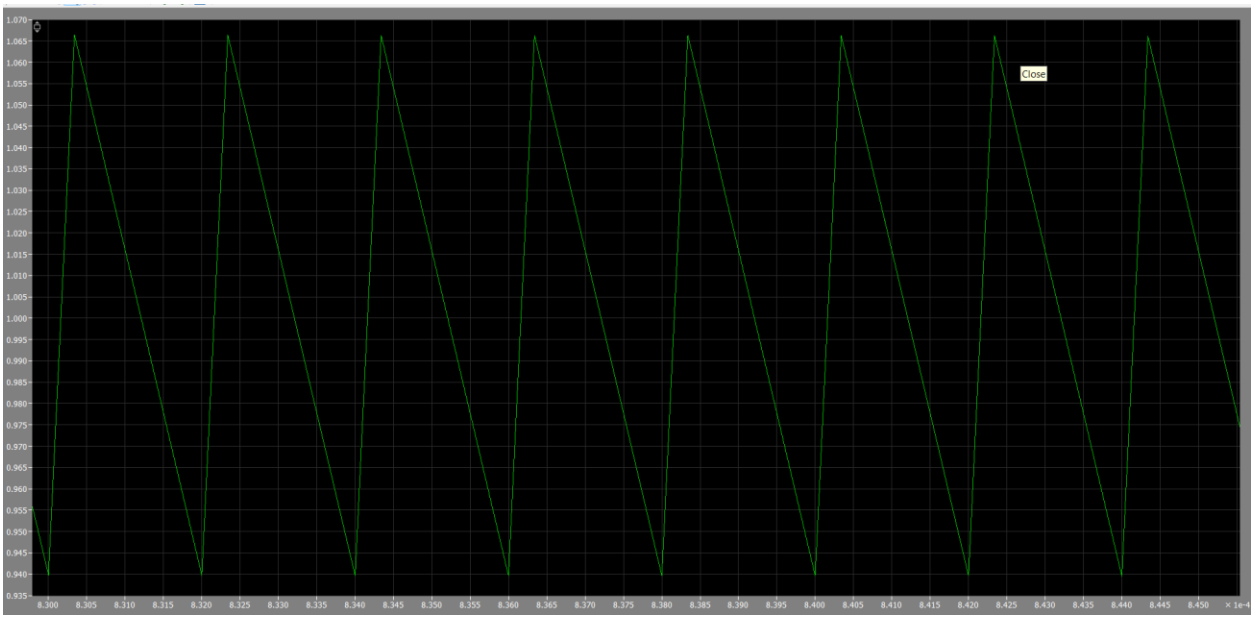
手算 PID 穩態電壓



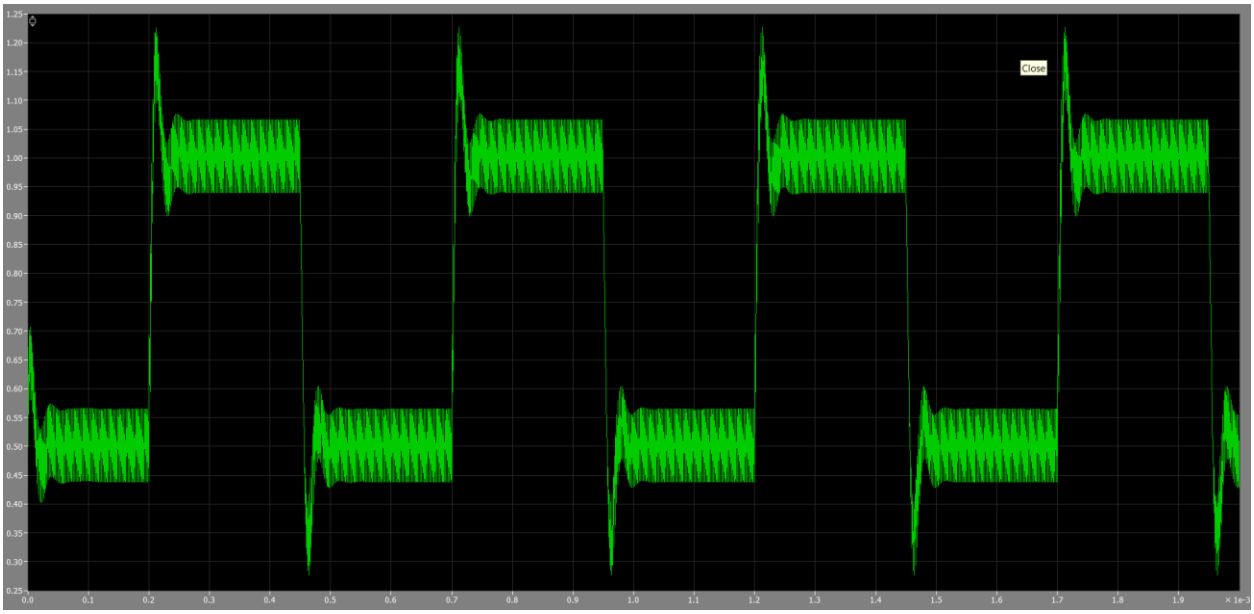
手算 PID 穩態電流



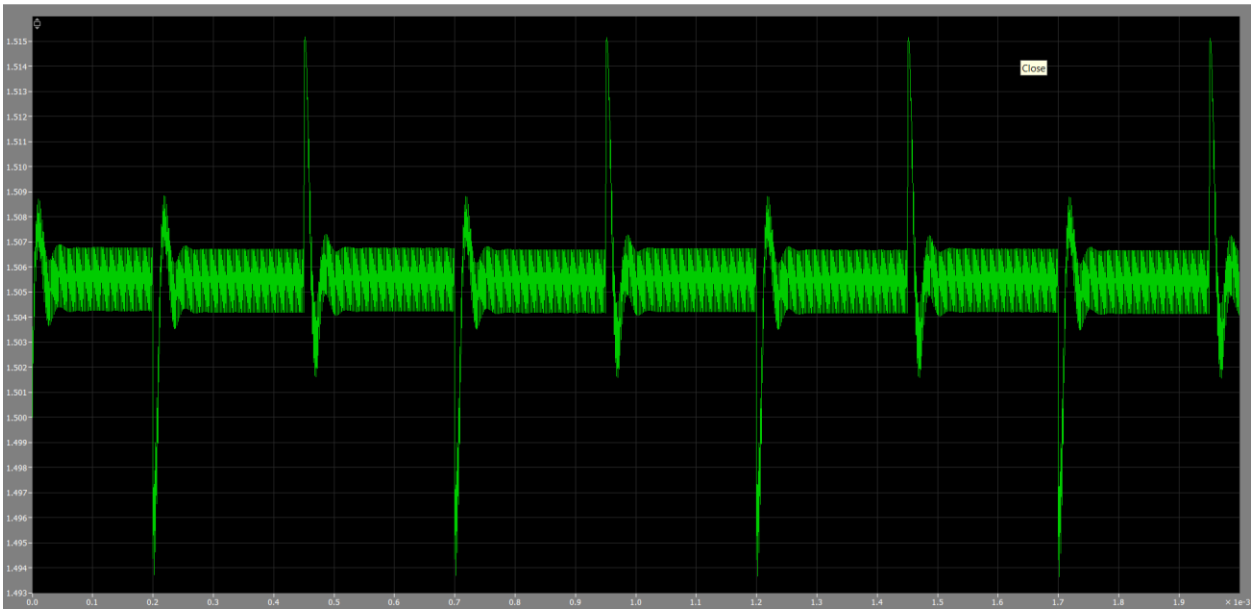
0.5A 穩態電流



1A 電流



手算 PID 穩態電流



手算 PID 暫態電壓